

WHAT IS CLAIMED IS:

1. A foreign material detector for detecting a foreign material caught between a closing movement side end portion of a movable body and a closed body, which is applied to an opening and closing mechanism in which the movable body moves in the closing movement direction with respect to the closed body, the movable body moves toward a closing direction which is leaned with respect to the closing movement direction immediately before the closing movement direction side end portion of the movable body reaches a closing movement end point located substantially at an orthogonal direction lateral side of the closed body with respect to the closing movement direction, and the movable body thus closes a gate provided between the movable body and the closed body along the closing movement direction, comprising:

a pressure sensor, which is directly or indirectly mounted to the movable body at a lateral side of the movable body along a substantial orthogonal direction with respect to the closing movement direction, moves with the movable body, and detects a pressed reaction force effected from the foreign material when it presses the foreign material.

2. The foreign material detector according to claim 1, wherein the pressure sensor comprising:

an outer cover portion which is hollow and formed of a synthetic resin material which is elastically deformable due to the pressed reaction force;

a plurality of wires which are provided in an inner side of the outer cover portion and come into contact to connect to each other due to the elastic deformation of the outer cover portion; and

an accommodating portion which has a rigidity higher than the outer cover portion and retains the outer cover portion at a side opposite to the closing movement direction or the closing direction of the outer cover portion.

3. The foreign material detector according to claim 1, wherein the pressure sensor is offset toward an inner side of the closing movement direction of the movable body end portion and toward the closing movement end point.

4. The foreign material detector according to claim 2, wherein the pressure sensor is mounted to the movable body in a state in which a gap is formed between the pressure sensor and the closing movement direction side end portion of the movable body.

5. The foreign material detector according to claim 2, wherein the accommodating portion includes a recessed portion which covers a part of the outer cover portion, the recessed portion comprises a first end portion and a second end portion, the first end portion is located at a forward position along the closing movement direction, compared with the second end portion.

6. The foreign material detector according to claim 3, wherein the movable body and the closed body is a pair of door panels.

7. The foreign material detector according to claim 3, wherein the movable body is a sliding door and the closed body is a wall.

8. The foreign material detector according to claim 4, comprising:

a supporting device which is integrally mounted to the movable body at a side opposite to the closing movement direction of the pressure sensor; and

a retainer in which a groove portion into which the supporting device can enter from the side opposite to the closing movement direction is formed, and which includes a nipping portion which nips a tip end portion of the supporting device entered the groove portion from both sides thereof, while retaining the pressure sensor.

9. The foreign material detector according to claim 5, wherein a flexible portion which is joined to the recessed portion of the accommodating portion to accommodate the outer cover portion is further included, an inner side of a structure in which the flexible portion is joined to the recessed portion has a catching hole, and a gap exists between an inner peripheral portion of the catching hole and an outer peripheral portion of the outer cover portion.

10. The foreign material detector according to claim 8, wherein the pressure sensor is offset toward an outer side of the movable body with respect to the supporting device.

11. A foreign material detector for a sliding door which is applied to a sliding door device, in which a door panel performs an opening and closing movement in a vehicle longitudinal direction, the door panel moves toward a closing direction which is leaned with respect to the vehicle longitudinal direction immediately before a closing movement direction side end portion of the door panel reaches a closing movement end point located at a lateral side of a vehicle side wall along a substantial orthogonal direction with respect to a closing movement direction, a gate provided in the vehicle side wall is thereby closed, comprising:

a pressure sensor, which is provided at a position offsetting toward a closing movement side of a tip end portion of the door panel and toward a vehicle right and left direction lateral side, along a vertical direction of the door panel, and detects catching of a foreign material occurred between the tip end portion of the door panel and the vehicle side wall.

12. The foreign material detector for a sliding door according to claim 11, wherein the closing movement direction of the door panel is

set to a direction which is leaned toward a vehicle transverse direction interior side with respect to the vehicle longitudinal direction, while the pressure sensor is offset toward the vehicle interior side of the tip end portion of the door panel.

13. The foreign material detector according to claim 11, wherein the pressure sensor comprises:

an outer cover portion which is hollow and formed of a synthetic resin material which is elastically deformable due to the pressed reaction force;

a plurality of wires which are provided in an inner side of the outer cover portion and come into contact to connect to each other due to the elastic deformation of the outer cover portion; and

an accommodating portion which has a rigidity higher than the outer cover portion and retains the outer cover portion at a side opposite to the closing movement direction or the closing direction of the outer cover portion.

14. The foreign material detector for a sliding door according to claim 12, wherein the accommodating portion includes a recessed

portion which covers a part of the outer cover portion, the recessed portion comprises a first end portion and a second end portion, the first end portion is located at a forward position along the closing movement direction, compared with the second end portion.

15. The foreign material detector for a sliding door according to claim 13, wherein the pressure sensor is mounted to the door panel in a state in which a gap is formed between the pressure sensor and the tip end portion of the door panel.

16. The foreign material detector for a sliding door according to claim 13, further comprising:

a supporting device which is integrally mounted to the door panel at a side opposite to the closing movement direction of the pressure sensor; and

a retainer which includes a groove portion into which the supporting device can enter from the side opposite to the closing movement direction and a nipping portion which nips the tip end portion of the supporting device entered the groove portion from both sides thereof, and retains the pressure sensor.

17. The foreign material detector for a sliding door according to claim 14, which further includes a flexible portion which is joined to the recessed portion of the accommodating portion and accommodates the outer cover portion, an inner side of a structure in which the flexible portion is joined to the recessed portion has a catching hole, and a gap exists between an inner peripheral portion of the catching hole and an outer peripheral portion of the outer cover portion.

18. The foreign material detector for a sliding door according to claim 16, wherein the pressure sensor is offset toward an outer side of the door panel with respect to the supporting device.

19. A method for detecting a foreign material caught in a sliding door device, in which a door panel performs an opening and closing movement in a vehicle longitudinal direction, the door panel moves toward a closing direction which is leaned with respect to the vehicle longitudinal direction immediately before a closing movement direction side end portion of the door panel reaches a closing movement end point located at a lateral side of a vehicle side wall along a substantial orthogonal direction with respect to a closing



movement direction, a gate provided in the vehicle side wall is thereby closed; the method comprising a step of:

detecting a foreign material which intersects the closing movement direction of the door panel and impedes closing of the door panel by a pressure sensor extending at the closing movement direction side of a tip end portion of the door panel and mounted to an outside of the door panel.

20. The method for detecting a foreign material caught in a sliding door device according to claim 19, further comprising the step of detecting a change in a current value when an outer cover portion of the pressure sensor is deformed by a reaction force of the foreign material and a plurality of wires accommodated within the outer cover portion contact to electrically connect to each other.